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GENERAL NOTES.

Members and friends of the Society are invited to aid the Committee on Publication in the work of this department. Communications to this end may be sent to FRANK SCHLESINGER, International Latitude Observatory, Ukiah, California.

The Force of Gravity at the Surface of the Earth.—Among the most useful instruments which the astronomer has at his disposal must be counted the pendulum. Not only does it furnish him with an accurate timepiece in his observatory, but it has enabled him to learn much about the shape of the Earth and the distribution of the material forming the Earth's crust. So important are these applications of the pendulum that many expeditions for this purpose have been sent to remote regions, chiefly during the last twenty years. At the present time the intensity of gravity has been determined at about fifteen hundred places, widely scattered over the Earth's surface. Dr. HELMERT, head of the Central Bureau of the International Geodetic Association at Potsdam, has recently issued a complete report on pendulum observations. This report contains an interesting map showing the distribution of the fifteen hundred stations. By far the greater number of these are in Europe; the badly neglected continents are South America and Australia, the former containing only eleven stations, and the latter only five. Thanks to many pole-seeking expeditions, the Arctic regions have been well surveyed as regards pendulum experiments. The most northerly station is in latitude $85^{\circ} 55'$, occupied by NANSEN in 1895. On the other hand, the Antarctic regions are totally vacant, the most southerly stations being in latitudes 63° and 56° , respectively. In Europe, in the United States, and in India there are many inland stations, but elsewhere the observations have almost exclusively been confined to the seacoast.

Within the past few months a method has been developed for the determination of gravity which, although much less accurate than pendulum experiments, has a larger sphere of usefulness, in that it may be employed at sea. Pendulum observations are, of course, impossible on the ocean, owing to the inevitable rolling of vessels. In the new method observations are made with a barometer and an hypsometer, the latter

being an instrument for the precise determination of the temperature at which water boils. As this varies with the pressure to which the water is subjected (being greater for high pressures), we may thus compute with considerable exactness the atmospheric pressure. Now, the barometer may be employed for the same purpose, but it will give precise results only if corrected for the intensity of gravity acting upon the mercury. It will therefore be seen that simultaneous observations with these two instruments, placed at the same height above sea-level, will enable us to compute the intensity of gravity at any place.

A series of such experiments was made last year by Dr. HECKER on the Atlantic Ocean. Six hypsometers and four mercurial barometers were employed, accordant results being obtained from all these instruments. The result of Dr. HECKER's observations is to show that the intensity of gravity on the sea is *normal*; that is, it is equal to the intensity upon the land in the same latitude. At first sight this result might seem an improbable one, because of the small density of the sea (about forty per cent) compared with that of the land at the Earth's surface. As the ocean is usually two or three miles deep, it will be seen that there is much less *mass* immediately under a vessel than under a point on land, and consequently we should expect gravity at sea to be less than normal. But it has been known for many years (or at least been regarded as probable) that the crust of the Earth underlying the ocean is more dense than elsewhere. Thus pendulum experiments on small isolated islands indicate greater gravity than normal; this is really equivalent to the case on the open sea, with the addition of the excess of the mass of the island over that of the water it displaces. Again, accurate geodetic operations show that the plumb-line on the shores of the ocean is deflected toward the latter. Finally, Arctic explorers have occasionally been able to make pendulum observations on the solid ice covering the deep sea, and these observations show normal intensities. It is interesting to note that the greater density of the Earth's crust underlying the oceans was deduced almost wholly from theoretical considerations by Archdeacon PRATT, of Calcutta, about the middle of the last century. The importance of Dr. HECKER's observations lies in the confirmation they afford of

PRATT'S hypothesis, or, as it is sometimes called, the *isostatic* hypothesis.

Variations of Latitude.—Three important papers on this subject have recently appeared,—two by Dr. CHANDLER, and the third by Professor KIMURA, who has charge of the Japanese station of the International Latitude Service. Dr. CHANDLER'S first paper is a "New Study of the Polar Motion for the Interval 1890–1901" (*Astronomical Journal*, No. 522), the former date corresponding to the first accurate observational data on the subject. The discussion is notably unbiased by the author's previous researches, and the results differ somewhat from those formerly published by him. According to the present paper the path of the pole is the resultant of three independent terms: (1) a circular motion, having a period of *fourteen* months; (2) an *annual* motion in a flat ellipse; and (3) a motion in an ellipse of slight eccentricity, and having a period of about *thirteen* months. The second of Dr. CHANDLER'S papers to which we have referred above is "On the Possible Existence of Still Another Term of the Polar Motion." This was put into a separate paper, in order, as the author says, "to separate what was fairly demonstrated, as it seemed to me, from what was problematical." The new term has a period of *fifteen* months and is extremely minute, having a coefficient of $0''.025$. It will be seen that the polar motion, as defined in these two papers, is by no means a simple one, especially since some of the elements of the separate motions appear to be subject to slow changes; notably the amplitude of the first term, that with a period of fourteen months.

The third paper adds to the complexity of this already complex subject. Professor KIMURA shows that there is a variation, having a semi-amplitude of only $0''.03$, and an *annual* period, which affects all stations alike, no matter how much they may differ in longitude,—that is, the effect is the same as though the center of gravity of the Earth were movable along the axis of rotation. If the mass of the Earth were all concentrated at its center, a movement of only five feet would account for Professor KIMURA'S variation. Whether this term is real is a question which needs further data to decide. The evidence deduced by KIMURA in favor of its existence is strong,

but the effect is very small, and the data were of necessity derived from observations made only in the Northern Hemisphere. Furthermore, as the term has an *annual* period, the effect may be an instrumental one. It is a fact, perhaps not without significance, that the maxima of KIMURA'S variation occur in July and January, when the Northern Hemisphere is hottest and coldest, respectively.

These three papers not only indicate the still unsettled nature of our knowledge of the subject, but they attest to the accuracy of modern latitude observations, permitting of the discovery and discussion of terms having coefficients of only two or three hundredths of a second.

In the death of MARIE-ALFRED CORNU, which occurred near Orleans, France, in April last, almost every branch of physical science has suffered a direct loss. Although in his sixty-second year, CORNU was unusually active, physically and mentally, and his death was most unexpected. To astronomers he was best known through his determinations of the mean density of the Earth and of the velocity of light. Both these determinations exceeded in accuracy any work that had preceded them, and are still among the standard ones. Besides these, he has made many valuable contributions to astrophysics and some to astronomy of precision. One of the latest of these was his design for a "zenith-nadir" instrument, to be used in determining the constant of aberration and the variation of latitude.

TH. BREDIKHINE, the well-known astronomer at Moscow, Russia, has established a biennial prize of about two hundred dollars as a memorial to his late wife. The prize is to be "for the encouragement to the continuation of the work of TH. BREDIKHINE on the development of cometary forms, from a purely mechanical point of view."

The Secretary of the Smithsonian Institution has granted an annual award of two hundred dollars for a period of four years to the *Astrophysical Journal*. This is to be used in maintaining the high standard of excellence of the *Journal*, especially as regards illustrations.

The Catalogue of the Astronomische Gesellschaft.—Two new installments of this great work have been distributed, those for the zones 30° – 35° and 35° – 40° . Only one more zone, 70° – 75° , remains to be published. The following table gives some of the details concerning the various parts of the catalogue:—

Zone.	Observatory.	Date when Published.	No. of Stars.
75° – 80° . .	Kasan	1898 . .	4,281
70° – 75° . .	Dorpat		. .
65° – 70° . .	Christiania	1890 . .	3,949
55° – 65° . .	Helsingfors and Gotha	1890 . .	14,680
50° – 55° . .	Harvard	1892 . .	8,627
40° – 50° . .	Bonn	1894 . .	18,457
35° – 40° . .	Lund	1902 . .	11,446
30° – 35° . .	Leiden	1902 . .	10,239
$24\frac{1}{4}^{\circ}$ – 31° . .	Cambridge, Eng.	1897 . .	14,464
20° – 25° . .	Berlin	1895 . .	9,208
15° – 20° . .	Berlin	1896 . .	10,161
10° – 15° . .	Leipzig	1900 . .	9,547
5° – 10° . .	Leipzig	1899 . .	12,785
1° – 5° . .	Albany	1890 . .	8,241
-2° – $+1^{\circ}$. .	Nicolajew	1900 . .	5,954

The whole catalogue, extending from South Declination 2° to North Declination 80° , covers a little more than half the area of the sky, and when the Dorpat zone is published will contain observations of the highest order on more than 130,000 separate stars. A southern continuation of the catalogue is in progress, to be called "Part Two of the Catalogue of the Astronomische Gesellschaft." As regards the area between 80° North Declination and the pole, it will be remembered that this is so well covered by CARRINGTON'S "Catalogue of 3,735 Circumpolar Stars" (1857) that it was deemed unnecessary to include this part of the sky in the Gesellschaft programme.

Astronomischer Jahresbericht for 1901.—The third volume of this important publication does not differ in any material respect from its two predecessors. It contains reviews of 2,513 papers and books on astronomical and closely related subjects, as against 1,768 and 2,320 for the first and second volumes, respectively. The increase over the second volume is due to

the appearance of *Nova Persei* in February, 1901, as no less than 228 reviews are devoted to this subject alone in the volume before us.

The work of reviewing so much material has, as heretofore, been done with truly astonishing completeness. How Dr. WISLICENUS can find time, in addition to his other duties, to read and epitomize an average of five papers or books a day is not easy to understand; and those who have had occasion to use the work will bear out the assertion that it shows no signs of having been hastily done. Almost all the reviews are written by Dr. WISLICENUS himself, the assistant editors serving chiefly to review works in the more uncommon languages. In this way it has been possible to include in the current volume reviews of papers in at least fourteen languages. It has been urged more than once against the *Jahresbericht* that too much space is devoted to reviewing popular articles. In this criticism we cannot concur; the work is thereby made more useful to amateurs, and it must be confessed that professional astronomers will profit by it as well,—for it is notorious that the latter, as a rule, do not spend much time upon technical papers outside of their own specialties. If they get a broad knowledge of their science at all, it is quite usually through the medium of popular exposition. In this connection we may recall the frank statement of the late Professor P. G. TAIT: “I have abstained from reading the details of any investigation (be its author who he may) which seemed to me to be unnecessarily complex. Such a course has inevitably certain disadvantages, but its manifest advantages far outweigh them.”
